

Death Investigation and Certification in Italy

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ABSTRACT

The certification of cause and manner of death is fundamental for legal and epidemiological purposes. In Italy, as in several other European countries, the death certificate is legal proof of an individual's death. The incorrect assessment of cause and manner of death can have serious implications for public health and the judicial system. Unnatural deaths can be erroneously reported as natural deaths, leaving accidents or homicides undetected. Many reasons can explain such inaccuracy, such as the level of training of medical practitioners involved in death investigations or a lack of information regarding the decedent's medical history. In January of 2011, the Italian death certificate changed to conform to European rules dealing with statistical recording. This paper discusses the concept of manner of death in the Italian death investigation system, along with a brief history of Italian legislation, and discussion of the professionals involved in the certification of death, responsibilities for the determination of cause and manner, and how the manner of death is used. *Acad Forensic Pathol.* 2015 5(3): 454-461

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INTRODUCTION

The certification of cause and manner of death is fundamental for several legal and practical purposes. Proper death certification is required to arrange a burial or cremation, and to recognize unnatural deaths supporting a judicial process or compensation claims (1, 2). Death certificates also serve as legal proof of an individual's death (3). Worldwide, they are the main source of national mortality and vital statistics, as well as other epidemiological data of public interest such as morbidity. The recording of these data has played an important role in the development of modern medicine and strategies of public health.

The accuracy of death certificates is questionable for various reasons, including the level of expertise and training of the medical practitioner and personnel involved in the death investigation, lack of medical records related to the deceased, lack of circumstantial information related to the fatal event, and the perceived lack of importance of the death certificate (4, 5). In the English-speaking world, the coroner has been charged with the determination of cause and manner of death since the 11th century (6), and the coroner in some jurisdictions is not required to have a degree in medicine. In recent history there has been a trend to replace coroners with physicians specifically educated as medical examiners since death investigation often involves medical issues and necessarily requires the involvement of appropriately trained medical personnel (7). In Italy, as in most of Europe, only a medical practitioner can determine how and why a person died.

The incorrect assessment of cause and manner of death affects not only statistics, but may allow unnatural deaths to go undetected (8). The determination of cause and manner of death is an opinion given to the best of the certifier's knowledge, based on clinical findings and information available at the time the death certificate is completed. The certification of cause and manner of death should be reliable and objective, based on external examination or autopsy and review of medical records and circumstances related to the death, preferably by a trained physician (3, 4).

Correlation of medical history with physical findings on the body and laboratory tests is the classical medical approach for establishing a reliable diagnosis (6).

A substantial discrepancy between the diagnoses listed on death certificates and diagnoses made at autopsy persists in modern medicine (9-11). Lack of training of the certifier, the inaccuracy in the certification, and limited postmortem examinations (such as external examination without a subsequent autopsy) often explain such discrepancies (11-14). The forensic pathology community is aware that the risk of misclassification of cause and manner of death can be high, especially if a death is certified without an autopsy and scene investigation. The degree of certainty required to classify the cause and manner of death depends on the circumstances of the death (15). An autopsy, combined with the medical history, scene investigation and review of the circumstances of death, is still considered the gold standard for determining the cause and manner of death (15, 16). The autopsy is a reliable mechanism of quality control, especially in traumatic deaths (11) but in many countries, standard criteria for assigning cause and manner of death are lacking (17). This article will describe the concept of manner of death in the Italian death investigation system along with a brief history of model legislation, the categories and criteria adopted, the professionals involved in the certification of death and responsible for the determination of cause and manner, and how the manner of death is used.

DISCUSSION

Historical Background and Professionals Involved in the Certification of Death in Italy

In Italy, the first model legislation regarding death investigation was issued in 1910 (*Circolare Fani*). The *Circolare Fani* describes in detail the minimum standards of a forensic autopsy, including external and internal body examination. Article 103 of Italian Health Law (RD n° 1265, 27 July 1934) states that only the physician who has cared for the decedent and has knowledge of that person's medical history can certify the death. If the death has occurred without an

attending physician, or the cause and manner of death are uncertain, the death certificate can only be signed by a physician appointed by the Local Health Authority as the *necroscopo* (a physician specifically tasked to certify the death based on an examination of the body). In the Italian public hospitals, the *necroscopo* is usually the chief of the Department of Legal Medicine or, if this position is not present, the director of the hospital.

In Italy, there is no official death investigation agency (such as a coroner or medical examiner system) that investigates and certifies suspicious deaths. Departments of legal medicine in universities can be a resource in managing the death investigations in their own regions, but this happens only in large cities. For this reason, the position of the *necroscopo* can be crucial in a death investigation. The role of *necroscopo* was revised in 1990 by the Mortuary Police Rules (*Regolamento di Polizia Mortuaria* – RPM, law 285/90). Based on the RPM, the postmortem examination must be performed no earlier than 15 hours and not more than 30 hours after death. The examination can be performed sooner only in cases where there is certainty that death has occurred, such as dismemberment, decapitation, or the heart is electrically silent for not less than 20 minutes as recorded by electrocardiography. Furthermore, the decedent cannot be buried before 24 hours after death. For sudden deaths, the examination must be performed 30 hours after death. If the death has occurred without an attending physician, a hospital autopsy can be requested or performed by the *necroscopo*. Such nonjudicial autopsies are usually managed by the National Health Services, but a declining autopsy rate is occurring in Italy as in other countries. Factors contributing to the decline of autopsies include clinical reluctance, increased confidence in new diagnostic tools, cost containment, and concerns about legal action if a misdiagnosis is detected (16, 18, 19). In Italy, many nonjudicial or hospital autopsies can be changed to forensic autopsies. In every case of suspicious or violent death, as well as in potential medical malpractice cases, the physician completing the death certificate or the *necroscopo* must inform the Judicial Authority of the need for further investigation and request a forensic autopsy.

In Italy, as in many countries with Roman legal tradition, magistrates or prosecutors have absolute authority to proceed with further death investigation. Forensic autopsies are not mandatory, even when the manner or cause of death is unclear, or when a crime may be connected to the death. Law enforcement officers decide if an external examination is sufficient for the death investigation or if a forensic autopsy has to be performed. They can choose their medical expert based on training and competence, but sometimes poorly skilled physicians are appointed as medical examiners. Based on the conclusions provided by medical experts and generally after only an external examination of the body, law enforcement officers select the cases in which a complete forensic autopsy will be carried out. In the Italian death investigation system, the majority of violent deaths are still certified without a full autopsy.

According to a recent U.S. National Association of Medical Examiners (NAME) position paper, forensic pathologists, in the performance of their duties, should be considered neutral experts and not prosecution or defense experts, except when explicitly hired *ex parte* (20). They should not be dependent upon law enforcement officers for all their information, and they should be free of pressure from police, prosecutors, or other agencies to modify their conclusions. Manner of death classification should not be made to facilitate prosecution or investigations, or to promote a personal interest or agenda (15). This is very different from the Italian model, in which a forensic autopsy will most likely not be requested if the expert appointed by the prosecutor is able to find even a presumptive manner of death that is of no judicial interest. This model undoubtedly has contributed to the declining autopsy rate in Italy. Since external examinations are the most common method used to investigate unnatural deaths, toxicological analysis is often not performed since such additional testing would need to be authorized by law enforcement officers. Approximately 4-5% of the 580 000 deaths per year in Italy are due to non-natural causes (21), and the majority of traumatic deaths are certified without an autopsy or review of medical records. Therefore, misdiagnoses and misinterpretation of medical findings are inevitable.

The Italian Death Certificate

The death certificate must be completed as prescribed by the Italian Institute of Statistics (ISTAT). Since 1926, ISTAT has been the official institution collecting death certificates. In 2011, a new death certificate was designed by ISTAT based on previous Italian rules of law (Royal Law 1265/34 and Law 285/90) and conforming to European rules dealing with statistical recording (Rule EU 1338/08, 16.12.2008).

Prior to 2011, there were four different types of Italian death certificates based on sex and age: blue for males and pink for females, further divided into deaths less than one year of age and deaths greater than one year of age. Each death certificate contained two columns: one for natural deaths and one for violent deaths. Natural deaths required a full explanation of the cause(s), including the immediate, intermediate, and underlying causes of death, and any other disorders contributing to the fatal event. For violent deaths, the certifier indicated the manner of death by checking the appropriate box to indicate accident, suicide, homicide, or accident at work. A description of the injuries was required, as was a mode of death (e.g., intoxication, motor vehicle crash, hanging, gunshot, fall) and antemortem medical conditions contributing to death.

Since 2011, there are no more color-coded certificates for males and females. For female decedents, the certifier must indicate if the decedent was pregnant at death or within the preceding 12 months. There are no longer columns for natural and violent deaths: all conditions (disease, injury, intoxication) related to the immediate, intermediate and underlying cause(s) of deaths are summarized in a single chain of events, with time intervals or estimations (Part I). Contributing conditions are also listed on the certificate (Part II). For non-natural deaths, the circumstances of the death (e.g., fall, hanging, gunshot, intoxication) are entered and the manner of death (homicide, suicide, or accident) is checked on the appropriate box. Of note, in contrast to U.S. death certificates, Italian death certificates do not offer an undetermined manner. Additional fields collect information about the nature of accidents (such as work-related), the type

of transportation in transportation-related deaths, and the victim's position in motor vehicle deaths (driver, passenger, pedestrian).

Criteria for Proper Certification of Cause and Manner of Death

The cause of death refers to disease(s) or injury(ies), or their combination, that led to death. There may be underlying, intermediary, and immediate causes in a logical chain of events. The mechanism of death usually refers to anatomic, metabolic or physiologic alterations that alone give no etiologically specific explanation of what started the sequence of fatal events (22). Manner of death refers to the circumstances in which a death occurred. The investigation and findings from the death scene are extremely important. According to NAME guidelines (15), manner of death classification should be objective and based on simple, established criteria. On the back of the Italian death certificate are instructions for (and examples of) proper certification of cause and manner of death. Among the examples related to violent deaths, three common scenarios include a pedestrian struck by a motor vehicle, a case of anaphylaxis caused by medication, and a fall from stairs. For all these scenarios, it is recommended to list accident as the manner of death because the death was the result of unintentional or unpredictable events.

The ISTAT has realized that the certification of death requires training to properly complete the cause and manner of death. The purpose of the death certificate is not to identify the legal responsibility for a fatal event, but to provide a useful administrative tool by which deaths are grouped according to similar features. The certifier of death is expected to identify factors contributing to death, differentiate natural from unnatural deaths, and provide useful information surrounding the fatal event. If non-natural factors are identified as immediate or proximate causes of death, they must be properly placed on the death certificate. Where no non-natural factors (such as injury, drug toxicity, or other environmental hazards) contributing to death are identified, the death can be classified as natural (23). Proper manner of death classification is particu-

larly problematic in delayed deaths, where the original traumatic event may be overlooked by the certifier because of the time interval between injury and death. In Italy, apart from the instructions on the back of the death certificate, there are no standard criteria for assessing cause and manner of death. Written criteria and published guidelines are needed. Such guidelines are under construction by the Italian Group of Forensic Pathologists, resembling the Guide for Manner of Death approved by NAME in 2002 (15).

Manner of Death Categories

In Italy, the death certificate is not used in court as evidence of the cause and manner of death, but is used only to prove that a person is dead. In some countries around the world, death certificates are documents of public domain, while in others only relatives or persons with a lawful right or claim can obtain them. Although fatal events share similar features that allow them to be grouped into categories (6), every death is unique and might be further investigated in order to prosecute a suspected crime or to adjudicate a civil claim. A death classified originally as natural can be changed to an unnatural manner based on new investigative findings. All medical practitioners need to be aware that manner of death can be changed based on new circumstantial information.

For example, an accidental manner can cover a wide range of fatal scenarios among which only “accident at work” has been considered worthy of mention on the Italian death certificate. Occupational fatalities usually include falls, motor vehicle accidents, electrocution, blunt trauma due to falling objects, or as a result of fires or explosions. Since they are preventable, in Italy, such fatalities can be also prosecuted as second-degree murder or manslaughter because worker safety is not only responsibility of the worker, it is the primary responsibility of the employer. The occupational death can be the combination of unsafe work environments, insufficient safety practices, or negligent employer supervision. Such failings are not listed on the death certificate, as they have to be evaluated in the context of applicable criminal and civil laws.

According to Saukko and Knight, manner of death is not as much a medical decision as it is an administrative categorization (1). The World Health Organization has developed specific recommendations to improve the accuracy of the cause and manner of death (24). In order to assist medical practitioners in completing the death certificate properly, these guidelines have been incorporated in the Italian death certificate. However, although some general scenarios are well established and generally accepted, classification of manner of death can be controversial for others, such as for therapy-related deaths and delayed deaths.

We believe it would be useful to add in the Italian death certificate an additional manner of death: “therapeutic complication.” Death investigation for medical malpractice is increasing worldwide and, although there are no official data on the autopsy rate in Italy, forensic autopsies performed on therapy-related deaths are probably much more frequent than those related to occupational fatalities. In Italy, since 2010, fewer than 1000 occupational deaths per year have been reported by the National Institution for the Assurance of Accidents at Work, with a decreasing trend up to 2014. In contrast, deaths related to preventable errors in medical practice are increasing, and expected to be per year much more than occupational deaths. According to Gill et al., the certification of therapeutic complication allows more consistent reporting of deaths occurring under medical care (25). Another option would be healthcare-related accident, which has the advantage of keeping the current system of classifying most such events as accident (26). Both terms have the advantages of not being synonymous with negligence or malpractice, as it is beyond the expertise of the certifier to evaluate the appropriateness of treatment or the responsibility of the clinicians. A specific subcategory of accidental manner of death for fatalities under medical care could cover potentially all those questionable scenarios, ranging from predictable but undesirable complications occurring during diagnostic or therapeutic procedures like nosocomial infections to adverse reactions to drugs or other clinical or surgical interventions that carry a known but acceptable risk.

In contrast to U.S. death certificates, Italian death certificates do not offer an undetermined manner. It is our opinion that this option should be also listed in the Italian death certificate with an appropriate box. In several cases the findings at the autopsy do not explain the manner of death even after further testing (e.g., toxicology, histology, microbiology). Undetermined as an additional subcategory of manner of death could help to inform the relatives, the offices of public health and law officers (e.g., judges, magistrates, lawyers) that even a complete death investigation including body external and internal examination cannot always determine cause and/or manner of death. According to NAME guidelines, sudden infant death syndrome or sudden unexpected and unexplained deaths may be better classified as undetermined, as well as other scenarios when there is not enough clinical or circumstantial information to classify them otherwise or other categories are not appropriate (15). Undetermined in manner could be also used in those rare cases where evidence exists to support more than one possible determination as recommended by a NAME panel (27), even for some drug-related deaths where the misuse or abuse of opioids could be the result of a clear intent of self-harm and not simply an accident.

CONCLUSION

The death certificate is a document that serves different purposes. Properly assessing the cause and manner of death requires training to reduce the risk of misclassification. Inaccuracy in death certification is a worldwide problem in clinical and forensic practice, affecting the reliability of statistical data derived from death certificates.

A retrospective study of deaths certificates in an academic institution found that 34% of cases had no proximate cause of death, or the wrong cause and manner of death (4). Medical examiners and coroners have an error rate up to 28% in determining cause and manner of death if an autopsy is not performed, especially in apparent natural deaths (12, 14). The majority of errors have been reported to be the result of an over-diagnosis of coronary heart disease, hypertensive cardiovascular disease, and cancer (13, 14). In the classification of manner of death, disagreement among medical ex-

aminers and coroners can be high, particularly in challenging death scenarios (5), and raising the need for peer review in forensic pathology (28).

Misdiagnoses are inevitable in Italy, because most deaths are certified by untrained clinicians, are based on external examination without a subsequent autopsy, and/or have limited review of medical records and circumstantial information. New death certificates have helped, but the risk of inaccuracy remains high when the cause and manner of death are not supported by autopsy findings and/or scene information. This is particularly true for trauma deaths in Italy, as the investigation of such deaths is usually not accompanied by radiological imaging nor blood samples for toxicological analysis. The lack of basic knowledge regarding traumatic injuries recently led to the misinterpretation of medical findings and an inaccurate manner of death in a case of undetected patricide (29).

Despite advances in imaging techniques, both minor and severe injuries often can be discovered only at autopsy (11). Previous studies on the accuracy of the cause of death as recorded on death certificates have shown unrecognized injuries in 11% of all cases (10, 30). Other studies of missed injuries discovered at autopsy after traumatic death have shown missed injury rates up to 68% (11, 30, 31). In a study of 155 consecutive forensic exhumations, major deviations between the cause and manner of death as stated on the death certificate and as diagnosed after autopsy were found in 37% of cases, with an emphasis on undetected homicides (32). It has been estimated that in Germany, some 1200 homicides per year go unrecognized on death certificates because no forensic autopsy was performed (8).

Forgoing forensic autopsies in trauma deaths is a violation of Recommendation No. R 99 of the Committee of Ministers (Council of Europe) adopted in 1999 (33, 34) and partially applied in several European countries. The main scope of the EU recommendation dealing with the harmonization of medicolegal autopsy rules in Europe was to underscore some principles and procedures, including 1) cases where death may be due to unnatural causes, the competent authority, accompanied by one or more medicolegal experts, should where

appropriate investigate the scene, examine the body and decide whether an autopsy should be carried out; and 2) autopsies should be carried out in all obvious or suspected unnatural deaths including domestic and occupational accidents, suicides or suspected suicides, homicides or suspected homicides, sudden unexpected infant deaths, suspected medical malpractice, and deaths in custody or associated with police activities.

For all these events, manner of death should not be classified only on the basis of the external examination of the body, and the death investigation should not be performed by individuals with no specific training. Differences in legislation regarding cause and manner of death among territories of the same European country can lead to inaccuracy in death certification.

More efforts should be made to improve the quality, completeness, efficacy and management of death investigation in Europe. In June of 2013, in testimony to a U.S. Senate Committee (35), the NAME President highlighted weaknesses of the U.S. death investigation system (many similar to Italian weaknesses) including obsolete legislation and the variety of jurisdictions involved in death investigation across the U.S. Although significant progress in the forensic sciences continues, major challenges still face the forensic science community (36).

The Italian system of death investigation has two main disadvantages: it is sometimes performed by individuals with no specific training, and majority of violent deaths are certified without an autopsy or further testing. The forensic autopsy is a reliable form of quality control, which informs public health and the judicial system while lessening the risk of inaccurate certification of cause and manner of death.

Italy has still no official system of peer review, or a method of quality improvement, to review death certificates or postmortem external examinations. Standard operating procedures in death certification, coupled with policies to evaluate the performance of the certifier of death, would be beneficial. Review of a death certifier's work by outside experts (external peer review) can be a useful part of quality improvement in

death investigation, and will likely be more common in the future due to the changing nature of forensic practices (20, 37). A peer review program should not have a punitive enforcement component, and should maintain confidentiality of findings.

In Italy, as well as other European countries with similar death investigation systems, there is a strong need for a formal and/or federal entity that would oversee forensic science and death investigation as already recommended by the U.S. National Research Council since 2009 (36, 38). The establishment of an independent National Institute of Forensic Science could address most major concerns in death investigation systems, promoting the adoption of Recommendation No. R 99. Such an entity could also improve the quality of forensic services, including medicolegal death investigation, in a multidisciplinary context and practice based on scientific principles. This could prevent the risk of misdiagnosis or missing autopsies, improving the primary task of any medicolegal death investigation, which is the reliable certification of the cause and manner of death.

REFERENCES

- 1) Saukko P, Knight B. Knight's forensic pathology. 3rd ed. New York: Arnold Press; 2004. 720 p.
- 2) DiMaio VJ, DiMaio D. Forensic pathology. 2nd ed. Boca Raton: CRC Press; 2001. 565 p.
- 3) Hanzlick R, editor. Cause of death and the death certificate: important information for physicians, coroners, medical examiners, and the public. Northfield (IL): College of American Pathologists; 2006. 244 p.
- 4) Pritt BS, Hardin NJ, Richmond JA, Shapiro SL. Death certification errors at an academic institution. *Arch Pathol Lab Med.* 2005 Nov; 129(11):1476-9. PMID: 16253030.
- 5) Goodin J, Hanzlick R. Mind your manners. Part II: General results from the National Association of Medical Examiners Manner of Death Questionnaire, 1995. *Am J Forensic Med Pathol.* 1997 Sep; 18(3):224-7. <http://dx.doi.org/10.1097/00000433-199709000-00002>. PMID: 9290868.
- 6) Davis GG. Mind your manners. Part I: History of death certification and manner of death classification. *Am J Forensic Med Pathol.* 1997 Sep; 18(3):219-23. <http://dx.doi.org/10.1097/00000433-199709000-00001>. PMID: 9290867.
- 7) Hanzlick R. The conversion of coroner systems to medical examiner systems in the United States: a lull in the action. *Am J Forensic Med Pathol.* 2007 Dec; 28(4):279-83. <http://dx.doi.org/10.1097/paf.0b013e31815b4d5a>. PMID: 18043011.
- 8) Madea B, Rothschild M. The post mortem external examination: determination of the cause and manner of death. *Dtsch Arztebl Int.* 2010 Aug; 107(33):575-86; quiz 587-8. <http://dx.doi.org/10.3238/arztebl.2010.0575>. PMID: 20830284. PMCID: PMC2936051.

- 9) Sington JD, Cottrell BJ. Analysis of the sensitivity of death certificates in 440 hospital deaths: a comparison with necropsy findings. *J Clin Pathol.* 2002 Jul; 55(7):499-502. <http://dx.doi.org/10.1136/jcp.55.7.499>. PMID: 12101193. PMCID: PMC1769693.
- 10) Sharma BR, Gupta M, Bangar S, Singh VP. Forensic considerations of missed diagnoses in trauma deaths. *J Forensic Leg Med.* 2007 May; 14(4):195-202. <http://dx.doi.org/10.1016/j.jcfm.2006.02.027>. PMID: 16914359.
- 11) Light TD, Royer NA, Zabell J, et al. Autopsy after traumatic death. A shifting paradigm. *J Surg Res.* 2011 May 1; 167(1):121-4. <http://dx.doi.org/10.1016/j.jss.2009.07.009>. PMID: 20031159. PMCID: PMC2891351.
- 12) Nashelsky MB, Lawrence CH. Accuracy of cause of death determination without forensic autopsy examination. *Am J Forensic Med Pathol.* 2003 Dec; 24(4):313-9. <http://dx.doi.org/10.1097/01.paf.0000097857.50734.c3>. PMID: 1463446.
- 13) Lorin de la Grandmaison G, Fermanian C, Durigon M. Analysis of discrepancies between external body examination and forensic autopsy. *Am J Forensic Med Pathol.* 2008 Mar; 29(1):40-2. <http://dx.doi.org/10.1097/paf.0b013e318165c77b>. PMID: 19749615.
- 14) Vanatta PR, Petty CS. Limitations of the forensic external examination in determining the cause and manner of death. *Hum Pathol.* 1987 Feb; 18(2):170-4. [http://dx.doi.org/10.1016/s0046-8177\(87\)80335-0](http://dx.doi.org/10.1016/s0046-8177(87)80335-0). PMID: 3804321.
- 15) Hanzlick R, Hunsaker JC, Davis GJ. A guide for manner of death classification [Internet]. Marceline (MO): National Association of Medical Examiners; 2002 Feb [cited 2015 Jun 10]. 29 p. Available from: <https://netforum.avectra.com/temp/ClientImages/NAME/38c0f1d2-11ec-45c7-80ca-ff872d0b22bc.pdf>.
- 16) Gill JR, Scordi-Bello IA. Natural, unexpected deaths: reliability of a presumptive diagnosis. *J Forensic Sci.* 2010 Jan; 55(1):77-81. <http://dx.doi.org/10.1111/j.1556-4029.2009.01227.x>. PMID: 20002277.
- 17) Hanzlick R, Goodin J. Mind your manners. Part III: Individual scenario results and discussion of the National Association of Medical Examiners Manner of Death Questionnaire, 1995. *Am J Forensic Med Pathol.* 1997 Sep; 18(3):228-45. <http://dx.doi.org/10.1097/00000433-199709000-00003>. PMID: 9290869.
- 18) Royal College of Pathologists of Australasia Autopsy Working Party. The decline of the hospital autopsy: a safety and quality issue for healthcare in Australia. *Med J Aust.* 2004 Mar 15; 180(6):281-5. PMID: 15012566.
- 19) O'Grady G. Death of the teaching autopsy. *BMJ.* 2003 Oct 4; 327(7418):802-3. <http://dx.doi.org/10.1136/bmj.327.7418.802>. PMID: 14525883. PMCID: PMC214120.
- 20) Melinek J, Thomas LC, Oliver W, et al. National Association of Medical Examiners position paper: medical examiner, coroner, and forensic pathologist independence. *Acad Forensic Pathol.* 2013 Mar; 3(1):93-8.
- 21) ISTAT [Internet]. Rome: ISTAT - National Institute of Statistics; c2015. The main causes of death in Italy; 2014 Dec 3 [cited 2015 Jun 10]. Available from: <http://www.istat.it/it/archivio/140871>.
- 22) Prahlow JA, Byard RW. Atlas of forensic pathology: for police, forensic scientists, attorneys and death investigators. New York: Humana Press; 2012. 906 p.
- 23) Dolinak D, Matshes EW, Lew EO. Forensic pathology: principles and practice. San Diego: Academic Press; 2005. 690 p.
- 24) International statistical classification of diseases and related health problems. 10th rev. Geneva: World Health Organization; 2011. 195 p.
- 25) Gill JR, Goldfeder LB, Hirsch CS. Use of "therapeutic complication" as a manner of death. *J Forensic Sci.* 2006 Sep; 51(5):1127-33. <http://dx.doi.org/10.1111/j.1556-4029.2006.00222.x>. PMID: 17018093.
- 26) Hanzlick R, Hunsaker J 3rd, Davis GJ. Commentary on: Gill JR, Goldfeder LB, Hirsch CS. Use of therapeutic complication as a manner of death. *J Forensic Sci.* 2006;51(5):1127-33. *J Forensic Sci.* 2007 Mar; 52(2):491; author reply 492. <http://dx.doi.org/10.1111/j.1556-4029.2007.00393.x>. PMID: 17316257.
- 27) Davis G, NAME and American College of Medical Toxicology expert panel on evaluating and reporting opioid deaths. National Association of Medical Examiners position paper: recommendations for the investigation, diagnosis, and certification of deaths related to opioid drugs. *Acad Forensic Pathol.* 2013 Mar; 3(1):77-83.
- 28) deJong JL, Hanzlick R. Level of agreement between opinions of medical examiner investigators and forensic pathologist medical examiners regarding the manner of death. *Am J Forensic Med Pathol.* 2000 Mar; 21(1):11-20. <http://dx.doi.org/10.1097/00000433-200003000-00003>. PMID: 10739221.
- 29) Campobasso CP, Laviola D, Grattagliano I, et al. Undetected patricide: Inaccuracy of cause of death determination without an autopsy. *J Forensic Leg Med.* 2015 Aug; 34:67-72. <http://dx.doi.org/10.1016/j.jflm.2015.05.008>. PMID: 26165662.
- 30) Sharma BR, Gupta M, Harish D, Singh VP. Missed diagnoses in trauma patients vis-à-vis significance of autopsy. *Injury.* 2005 Aug; 36(8):976-83. <http://dx.doi.org/10.1016/j.injury.2004.09.025>. PMID: 16005004.
- 31) Stothert JC, Gbaanador GB, Herndon DN. The role of autopsy in death resulting from trauma. *J Trauma.* 1990 Aug; 30(8):1021-5; discussion 1025-6. <http://dx.doi.org/10.1097/00005373-199008000-00012>. PMID: 2388303.
- 32) Karger B, Lorin de la Grandmaison G, Bajanowski T, Brinkmann B. Analysis of 155 consecutive forensic exhumations with emphasis on undetected homicides. *Int J Legal Med.* 2004 Apr; 118(2):90-4. <http://dx.doi.org/10.1007/s00414-003-0426-z>. PMID: 14986016.
- 33) Council of Europe Committee of Ministers, recommendation No. R (99) 3 of the Committee of Ministers to member states on the harmonization of medico-legal autopsy rules [Internet]. Strasbourg (France): Council of Europe; 1999 Feb 2 [cited 2015 Apr 28]. 15 p. Available from: [http://www.coe.int/t/dg3/healthbioethic/texts_and_documents/RecR\(99\)3.pdf](http://www.coe.int/t/dg3/healthbioethic/texts_and_documents/RecR(99)3.pdf).
- 34) Brinkmann B. Harmonization of medico-legal autopsy rules. Committee of Ministers. Council of Europe. *Int J Legal Med.* 1999; 113(1):1-14. <http://dx.doi.org/10.1007/s004140050271>. PMID: 10654232.
- 35) Testimony of Gregory A. Schmunk MD before the United States Senate Committee on Commerce, Science, and Transportation [Internet]. Northfield (IL): College of American Pathologists; 2013 Jun 26 [cited 2015 Apr 28]. 11 p. Available from: http://www.cap.org/apps/docs/statline/pdf/schmunk_testimony.pdf.
- 36) National Research Council, Committee on Identifying the Needs of the Forensic Sciences Community. Fragmented and inconsistent medicolegal death investigation. In: Strengthening forensic science in the United States: a path forward [Internet]. Washington: National Academies Press, c2009 [cited 2015 Apr 28]. p. 49-50. Available from: <https://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf>.
- 37) Oliver WR. The ethics of external peer review. *Acad Forensic Pathol.* 2013 Sep; 3(3):272-80.
- 38) National Research Council, Committee on Identifying the Needs of the Forensic Sciences Community. Strengthening forensic science in the United States: a path forward [Internet]. Washington: National Academies Press, c2009 [cited 2015 Apr 28]. 328 p. Available from: <https://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf>.